Remarks

Claims 1-6 are pending in this application. Claims 1 and 4-6 stand rejected under 35 U.S.C. 103(a) as being unpatentable over Cloutier (U.S. Patent No. 6,668,165) in view of Issa et al. (U.S. Patent No. 6,317,034). Claims 2 and 3 stand objected to as being dependent upon a rejected base claim.

The invention relates generally to radio frequency (RF) receivers. More particularly, the invention relates to an improved super-regenerative receiver arrangement capable of receiving narrow-band signals.

Generally, a super-regenerative receiver operates using an oscillating signal detector having the oscillation interrupted, that is, quenched, at a relatively low frequency. Because the quenching operation and frequency force the detector response to be very broad, super-regenerative receivers suffer from the need to use tuned input circuits to allow them to be used with narrow-band signals.

Claim 1 recites a narrow bandwidth, super-regenerative receiver. The receiver comprises a signal detector, a quench circuit and a frequency sweeping circuit. The signal detector has a regenerative oscillator for detecting a signal transmitted at a particular transmit frequency. The quench circuit is connected to the regenerative oscillator for interrupting the oscillation of the oscillator at a predetermined frequency.

The frequency sweeping circuit is connected to the regenerative oscillator and the quench circuit. The quench circuit is arranged to cycle the regenerative oscillator and the frequency sweeping circuit on and off together. The frequency sweeping circuit controls operation of the regenerative oscillator to a desired narrow bandwidth around the transmit frequency.

Put another way, claim 1 recites a super-regenerative receiver composed of a signal detector having a regenerative oscillator and a quench circuit connected to the regenerative oscillator, wherein a frequency sweeping circuit is connected to the regenerative oscillator and the quench circuit to control operation of the regenerative oscillator to a desired narrow bandwidth around the transmit frequency.

That is, the addition of the frequency sweeping circuit to the regenerative oscillator and quench circuit is advantageous in that it results in the regenerative oscillator functioning as a center frequency movable (sweeping) band pass filter with a narrow band. As explained in the background art on page 1 of Applicant's specification, prior super-regenerative receivers suffer from the need to use tuned input circuits to allow the use with narrow band signals. Applicant's invention addresses this problem by providing an improved super-regenerative receiver including a frequency sweeping circuit among other elements as recited by claim 1.

Specifically, the combination defined by claim 1 includes "a frequency sweeping circuit connected to the regenerative oscillator and the quench circuit, wherein the quench circuit is arranged to cycle the regenerative oscillator and the frequency sweeping circuit on and off together, and the frequency sweeping circuit controls operation of the regenerative oscillator to a desired narrow bandwidth around the transmit frequency."

Cloutier describes an inverted super-regenerative receiver. More specifically, Cloutier describes an amplifier for high gain, narrow band signal amplification. The disclosed embodiment is an amplifier that is controlled to provide narrow band signal amplification. As best conveyed by Figure 10, positive feedback resonant circuit 100 (KT Cell) uses a feedback loop to hold the bias at a proper level for a matched filter, and the gain is periodically increased to force oscillation. Col. 6, lines 7-10. As explained by Cloutier, "as a result of the fact that the Q is momentarily lowered when the oscillation starts, the Q buildup is relatively fast. Also, the oscillation phase starts with a relatively large signal present in the loop and

hence the exponential buildup is much faster than if the start were from a point with no energy in the loop." Col. 6, lines 20-25.

Cloutier does describe an amplifier for high gain, narrow band signal amplification. To achieve this end, Cloutier, as exemplified in Figure 10, uses a feedback loop and Q control approach. As clearly shown in Figure 10, a raw Q control and a Q control signal are compared at 115, and connect through Q charge pump 116 and Q loop filter 118 to multiplier 122.

In contrast to Cloutier, the invention uses a far different approach to implementing a narrow bandwidth, super-regenerative receiver. As recited by Claim 1, the claimed super-regenerative receiver includes, among other limitations, a regenerative oscillator connected to a quench circuit in combination with a frequency sweeping circuit. Cloutier fails to describe or suggest the claimed frequency sweeping circuit and its relationship among the other elements to achieve the claimed invention, but instead only describes a Q control approach utilizing feedback to control Q and operate between oscillation and close to oscillation. More specifically, the prior art fails to suggest "the frequency sweeping circuit controls operation of the regenerative oscillator to a desired narrow bandwidth around the transmit frequency" as recited by claim 1.

The Examiner relies on Issa as suggesting the modification of Cloutier to incorporate interrupting the oscillation of the oscillator at a predetermined frequency to achieve the claimed invention. As explained above, Cloutier uses a far different approach than recited by claim 1 and has fundamental deficiencies. Issa does not address the deficiencies of Cloutier, and Cloutier in combination with Issa fails to suggest the claimed invention. There is no motivation to combine Cloutier and Issa to achieve the claimed invention.

In the Final Action, the Examiner responds to Applicant's arguments by stating that "the fact that Cloutier has an additional element of inverting merely means that Cloutier teaches all of the claimed limitations of the Applicant and has [the] additional element of

inverting." Cloutier uses a far different approach than recited by claim 1 and has fundamental deficiencies. Cloutier does describe an inverted super-regenerative receiver. But the Cloutier receiver fails to suggest the claimed frequency sweeping circuit and its relationship among the other elements to achieve the claimed invention, and none of the relied upon prior art addresses this deficiency.

In the Final Action, in response to Applicant's arguments, the Examiner further states (in paragraph 3) that Cloutier teaches a frequency sweeping circuit (104, Figure 10). Element 104 is a circuit for controlling the center frequency of the KT Cell 100. Applicant directs the Examiner's attention to Cloutier, column 6, line 35 - column 8, line 13. This portion of Cloutier describes operation of the exemplary embodiment in great detail. Specifically, column 7, lines 7-48 describe operation of the low bandwidth phase locked loop and application of the loop output to frequency control circuit 104 of KT Cell 100. It is made quite clear that frequency control circuit 104 is not a frequency sweeping circuit as recited by claim 1.

In contrast to the frequency sweeping circuit approach contemplated by Applicant, Cloutier utilizes a combination of a phase locked loop and Q control loop together with a crystal controlled frequency to implement the inverted super-regenerative receiver. There is no frequency sweeping, and there is no motivation to combine Cloutier and Issa to achieve the claimed invention. After all, Cloutier improves upon the classic super-regenerative receiver (SRG) by providing an inverted super-regenerative receiver (ISRG). In a far different approach, Applicant's invention involves a specific combination involving a frequency sweeping circuit with a particular relationship among the other elements of the super-regenerative receiver.

In further regard to Issa, Issa does not address the deficiencies of Cloutier, and Cloutier in combination with Issa fails to suggest the claimed invention. Further, the invention relates to an improved super-regenerative receiver arrangement capable of receiving narrow

band signals, while Issa relates to security systems and multiplexing sensor output signals. Thus, Issa is not within the same field of endeavor.

Further, Applicant's invention addresses the problem with the existing super-regenerative receivers in that the existing super-regenerative receivers suffer from the need to use tuned input circuits to allow them to be used with narrow band signals. Issa is not related to this particular problem and would not commend itself to an inventor's attention when facing this problem. After all, Issa relates to security systems and alarm sensor multiplexing. Thus, in addition to the reasons for patentability explained above, Applicant also contends that Issa is non-analogous art, and cannot properly be used in a rejection based on a combination of references.

Claims 4-6 depend from claim 1, and are also believed to be patentable for at least the reasons for patentability presented above for claim 1. Note that claims 2-3 do not stand rejected.

Respectfully submitted,
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